

Hazardous Solid Wastes Generated in the Cleanup of Air and Water

by Merril Eisenbud*

Air and water pollution control programs sometimes result in production of solid wastes that are difficult to manage. The sludges from sewage treatment plants and flue gas scrubbers are two examples. In many coastal communities, there is no alternative to ocean dumping of sewage sludges for the foreseeable future. The use of sludges as soil conditioners, their conversion to fuels by pyrolysis, and other alternatives are frequently mentioned options, but they have not been demonstrated to be practical on a large scale. The Federal requirement that ocean dumping be terminated by 1981 presents the large seaboard population centers with a dilemma, due to the absence of economically feasible alternative methods of disposal.

Another major solid waste problem is arising from the Federal policy that requires flue gas desulfurization on practically all power plants. This policy, designed to reduce sulfur oxide emissions, will require that vast quantities of sludge be stored. Their environmental impact is as yet not fully evaluated. Commercial use of the sulfur or sulfates produced in these processes may be possible, but its practicability on a large scale remains to be demonstrated.

Unlike other presentations at this symposium, this paper will discuss solid wastes that are created in the course of operating air or water pollution treatment systems. The subject has already been discussed by others on this program.

Kaufman (1) referred to EPA policy concerning incineration of municipal wastes and I think anticipated some of the things that I will say when he pointed out that the Government as of now does not know where the money will come from to develop alternative methods of sludge disposal when ocean disposal must cease in accordance with Federal dictates. Harrington (2) also discussed the sludge problem and stated that ocean dumping is not environmentally acceptable; he also reported that pyrolysis, direct application to soil, trenching, and composting were only in a preliminary state of development. Yet, these are the only possible alternatives to ocean disposal in many parts of the country.

Hugh Van Noordwyk (3) discussed the problems of wastes generated by water treatment processes in the chemical industries. I will not deal with that subject, because the problems are so specific that it is not possible to develop a general approach to the subject. This is also true of the treatment of liquid

wastes from the metallurgical industries.

I will supplement what Jones (4) said about power plant wastes, but I will not touch on the subject of nuclear power except to say that, in my opinion, when the decision was made to reduce the amounts of radioactivity that could be discharged to the general environment by a factor of about 100, as specified in Appendix I to Part 50 of CFR Title 10, solid waste handling problems were created within the plant that raised the exposure levels to which the reactor workers were exposed. This is something that should be fully investigated. It may be that we lost more than we gained as a consequence of the decision to reduce the permissible releases.

My remarks will deal mainly with the special problems of the large coastal metropolitan complexes. Much of what I have to say will have to do with our experiences in New York.

A classical example of the trade-off between air pollution wastes and solid wastes took place beginning in 1951, when a law was passed in New York City that required all apartment houses to install incinerators to reduce the volume of solid waste. This decision assisted the Sanitation Department by greatly reducing the cost of collection. It was not until 1966, about 15 years later, that the city suddenly realized that the apartment houses, by installing incinerators, created 17,000 point sources

* Institute of Environmental Medicine, New York University Medical Center, 550 First Avenue, New York, New York 10016.

of air pollution that were going to be very difficult to control. The Commissioner of Air Resources in 1967 issued an order that shut down many of the incinerators, necessitating that the Sanitation Department assume an additional burden of waste collection that they could not handle because they did not have the manpower or the trucks. This was one of several incidents that caused the city to consolidate the Departments of Sanitation, Air Resources, Water Supply, Water Pollution Control, and Noise Control; all of those departments were brought together into the city's EPA.

The Environmental Protection Administration in New York City was formed in 1968, about three years before the Federal EPA was organized. It was a great time to get started. The new environmental movement was on its way; there were new laws being passed: people were willing to provide money for research; there was great political support. It is very disappointing, after ten years, to find that pollution control is generally in a state of confusion. I've heard it said by people in positions of environmental responsibility that they know how to deal with their enemies, but they don't know how to handle their friends. That was our experience in New York City. Our "enemies," if I can use that term as an ex-city EPA Administrator in a large city of nearly eight million people, included the real estate operators, the taxi cab owners, local industry, and governmental agencies that operated facilities with obsolete waste treatment systems. Somehow we could deal with them. But it was impossible to explain to our "friends" in the local noise abatement and clean air societies, for example, why it would take three years to control the emissions from 17,000 apartment house incinerators, and five years to produce a noticeable change in the noise levels in New York City; our friends and supporters, the concerned citizens, could not understand why we could not do everything that needed to be done in a year. There was tremendous pressure on the timetable they thought necessary, not because they could cite technical reasons for reordering priorities, but because they were expressing their perceptions of what the problem was.

There are really two major problems that I should talk about. One is the problem of the sewage sludges. I guess most of you have heard the term "Dead Sea," which is applied to an area in the New York bight in which sludges of all kinds have been dumped since 1924. The sludges are not only from the sewage treatment plants, but also construction debris as well as certain types of chemical wastes. The practice of sludge dumping in the New York Bight became a matter of concern because the volumes of wastes were growing, and a study was

commissioned to examine the ecological effects of this practice. The findings of that study were presented at the New York meeting of the Water Pollution Control Association in the spring of 1969. It was a straightforward, factual report that indicated that the sludges had accumulated over an area of perhaps 30 or 40 km². The biological implications of this were to have been addressed in further studies and it was considered likely that some changes in sludge disposal practices would need to be made. However, there was no indication that a crisis existed.

Present at that conference was a political figure who held a press conference some time after the meeting, and he or one of his associates coined the term "Dead Sea." The original technical presentation was not covered in the press, but the press conference held by the public figure received a good deal of attention. Ever since, whenever there is a fish kill anywhere in the New York bight, or if garbage or sewage debris washes up on a nearby shoreline, the "Dead Sea" gets into the newspapers. The main point at the press conference, and in the publicity that the matter has received ever since, is that the sludge that had been deposited over this very long period is spreading laterally and is about to reach the beaches on Long Island and the New Jersey coast. This matter has been carefully examined by the National Oceanographic and Atmospheric Administration, who have found that the sludge is literally sliding down the Hudson River canyon and is going out into deeper waters and not spreading laterally. Somehow or other you just can't get this point across to the press.

The catchy term, "Dead Sea," has contaminated thinking with respect to sludge disposal on a national scale. I think that in New York there will have to be an adjustment of the sludge disposal methods, but we should ask ourselves what the effect is going to be when we do not deposit the undigested sludges from the primary treatment system, which result in anoxic conditions in the deeper waters during the summer months, but deposit only sludges from the high level treatment systems that are now under construction and are just beginning to come on line. And what if we stop dumping chemical waste there? And what if, instead of dumping the sludge in the relatively small area designated for that purpose, and thus creating a pile that is some tens of meters deep by now, what if we spread it out by having the sludge vessels cruise over larger areas so that the sludges are dispersed more widely. My ecological friends tell me that the ocean is a biological desert. Could it be that the disposal of these nutrients in the proper place and in the proper way could be beneficial to the environ-

ment rather than being unacceptable on ecological grounds?

The sewage sludge disposal problems require a lot of study on a case-by-case basis. I don't think that sludges in the New York Bight are going to behave the same as sludges would within the Cape Cod area or down in the Delaware estuary. In each case, the volume of waste should be considered and should be characterized chemically and physically. We may find that some sludges can be disposed of in the oceans and some cannot, and for those that can be disposed of in the oceans, that they can be disposed of in certain ways and not others.

To say categorically that the New York metropolitan area, which includes twenty million people, cannot have access to the ocean for sludge disposal without giving the local government alternative methods is sheer nonsense. If, in 1977, we do not have pyrolysis, and we do not have land disposal methods, then we certainly are not going to have them on a scale large enough by 1981 to take care of the needs of these population centers.

One of the problems that was touched on but not emphasized, with respect to the use of sludges on farm land, is that they are often heavily contaminated with toxic metals and organic compounds. I don't know what the solution to the problem is. New York, like many cities, has combined sewers. Everything passes through the sewage treatment plant, the storm waters, and the sanitary sewage (except when you have a heavy storm, and then everything bypasses the sewage treatment plant, which is another problem that people don't seem to want to talk about). It's been shown that about 50% of the trace metals that end up in the sewage treatment plant originate from the street surfaces as a result of storm water runoff. We do not know the origin of these trace elements. Some of it may be fallout from industrial sources or incinerators. Some undoubtedly just flakes off automobiles. Lead oxide from corroded storage battery terminals undoubtedly drops onto the road surface a little bit at a time and there are probably other toxic metals that do so as well. In any case, it has been shown that about 50% of what ends up in the sewage treatment plant actually runs off the street surfaces. This is a problem that is not going to be easily solved.

The question of power plant sludges is another one that should also be dealt with on a case-by-case basis. Dale Jones presented what I believe to be the most optimistic presentation that could have been made on this subject because of the relatively low ash and sulfur content of the coal used by the particular plants described in the presentation (4).

The need for scrubbers is determined by the present EPA emission standards. Those standards re-

quire further study and it will take another few years to put the subject on a rational basis. There are power plants at certain locations at which scrubbers should be installed, but there are other plants at other places where scrubbers are unnecessary, in my opinion. However, as long as we are adhering to the present emission standards, scrubbers will be needed on almost all new plants.

There is a very serious question in the minds of many people who have looked at the health effects data as to whether the present sulfur oxide emission standards are on a sustainable basis. About the time that the SO_2 standards began to be questioned, the sulfates became a source of concern. Although the sulfur dioxide concentrations have been reduced by 90% in New York City, the sulfate concentrations have hardly changed. They seem to be coming from sources other than those producing the sulfur dioxide locally. In other words, it could be Pittsburgh's sulfur dioxide that is being converted to the sulfates by the time it gets to New York. These are matters that should be better understood.

Now you might say, "Well, why take a chance; why not put the scrubbers in?" Two good reasons are that they are so expensive and that they create a solid waste problem. A scrubber for a 1000 MW plant will cost about \$100 million; it could cost as much as \$125 million, or if you have the right kind of coal, as little as \$75 million. The initial cost is a very significant fraction, from 15 to 20% of the total cost of the power plant. In addition, it takes 5% of the generated power to operate the scrubber. The volume of the wastes generated are staggering. When you express it on an annual basis for only one plant it doesn't seem like much, but many sites will have five or more plants, and they will operate for several decades. I visited a site recently where the first of five scrubbers has been operating for a little more than half a year. When you see the waste pond, it doesn't look like very much, but they will have five plants there soon which will operate for 40 years. The volumes become enormous. The Pennsylvania Electric Company is in the process now of damming a valley to a height of 400 ft (120 m) and will in 25 years create a lake of dried sludge 400 ft (120 m) deep and five miles (8 km) long. Do we know what the consequences will be of runoff from deposits such as these, not only in the next 40 years but the next 400 years? I don't think we do. I don't know why we have to plunge into a national policy that dictates scrubbers for every power plant above a certain size, which in effect means all power plants because they are all nowadays being built over the 200 MW or so that require the scrubbers. We can wait five years and get the facts.

This whole question took on an almost comical

type of urgency about two years ago when the then-chairman of the American Electric Power Company went on a crusade against the scrubber concept. His position was that the scrubbers would not work. The EPA stated they were feasible. Russel Train, the Environmental Protection Administrator, and Don Cook fought in the newspapers and electronic media: they were both wrong. Don Cook was right insofar as it went, because at that time it was true that the scrubbers were not working properly. The National Academy of Engineering took the position that before a scrubber design should be accepted, it should operate for about a year, and none had as yet operated successfully for that length of time. But it was clear to anybody who looked at the facts that the problems were going to be solved. They were mainly questions of materials compatibility that were bound to be worked out, and industry should have recognized that by waiting long enough—a year, two years, five years—the scrubbers would become available. But Russell Train, in my opinion, was equally wrong in saying that the scrubbers were then available when they were not, and I believe it was a mistake to commit the nation to a program which was going to require ten billion dollars a year of capital investment and four billion dollars a year of additional operating costs, until more facts were available.

It is estimated that the cost of automobile emissions control will be between \$5 and \$10 billion per

year, year in and year out. The cost for cooling towers for power plants will also be about \$5 billion per year. One can readily see that, by piling one upon the other, that these national policies will add tens of billions of dollars a year to consumer costs. These requirements are being imposed, mainly in the name of public health, at the very same time when health and welfare expenditures in the Federal government are being curtailed. Many cost effective programs have been eliminated because this is a period of inflation. On one hand, the government is cutting back some tens of millions of dollars of badly-needed health services, and on the other hand imposing tens of billions of dollars in the interest of pollution control systems of rather dubious benefit.

These are questions which I think should be investigated in the year or two ahead.

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